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ABSTRACT

Discriminant analysis was used to explore the influence of the relative ages of siblings on their dyadic interactions, and to explore which interaction behaviors might discriminate among families and among interaction situations. Six dyadic interaction situations of 30 minutes duration were observed among members of 12 normal families. The observations took place in the families' homes once a week for five consecutive weeks. The interaction situations consisted of (1) child-directed interaction with mother, (2) child-directed interaction with father, (3) child-directed interaction with older sibling, (4) mother-directed interaction, (5) father-directed interaction, or (6) sibling-directed interaction. The Dyadic Parent-Child Interaction Coding System was modified in order to record the interactions of the target child with mother, father, or older sibling. This modified coding system provided a frequency count of 34 discrete positive and negative behaviors which may occur between parent/sibling and target child during play. Observations were made by two researchers who independently and unobtrusively recorded behaviors at 1-minute intervals while subjects played with a standard set of toys. Results of the discriminant analysis indicated that interaction situations could be correctly classified 89 per cent of the time based on the linear combination of six behaviors: three parent/sibling behaviors (identified as Acknowledge, Unlabeled Praise, Descriptive/Reflective Question) and three child behaviors (identified as Compliance to Direct Command, Whine, and Child Change Activity). A combination of five behaviors correctly classified family groups 87 per cent of the time (Child Change Activity, Child Whine, Descriptive/Reflective Question, Unlabeled Praise and Child Laugh). Implications for future normative studies are discussed. (Author/RH)

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Discriminant Analysis of Family Interaction During Play

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Abstract

Six dyadic interaction situations, involving the younger target child during play, were observed with 12 normal families. Families were categorized into three groups: (a) both siblings between 2-5 years old; (b) 2-5 year-old younger and 6-9 year-old older sibling; and (c) both siblings between 6-9 years old. The coding system used recorded 34 discrete behaviors. Results of discriminant analyses indicated that interaction situations could be correctly classified 89% of the time based on the linear combination of six behaviors, and a combination of five behaviors correctly classified family groups 87% of the time. Implications for future normative studies are discussed.

Discriminant Analysis of Family Interaction During Play

Within the last decade, interest in the behavioral study of family interaction has increased partially as a result of the public's awareness and concern over child abuse and other family problems. By studying the everyday interactions that occur within relatively "normally" functioning families, researchers may begin to discover which interactions or systems of interactions predict or precipitate abuse, neglect, or other family problems.

Presently there is little information available about the typical behavioral interactions of a normal family. Much of the data collected has been either unreliable or ambiguous. In addition, there has been little or no actual baseline from which to measure the presence or degree of psychopathology in problem families (Haley, 1972). What is the range of possible behaviors that might define the norms for normal, non-problem families? Are there different ranges of behaviors for different situations, ages and sex of children, SES, etc? Wright (1966) believes there is a great need to describe what persons (or families) actually do and have done in different situations.

In a methodological review of parent-child interaction studies, Lytton (1971) believes that in the historical development of family studies, researchers have made a grave error in not conducting descriptive, normative studies of family interaction. One of the major stumbling blocks to conducting well defined normative studies has been the

lack of an appropriate, reliable observational methodology. Only within the past 10 years have the methodological barriers begun to fall.

Normative studies using formal observation

Only a few studies have dealt directly with the issue of obtaining normative data on the behavioral interactions between members of normal families (Dysart, 1973; Johnson, Wahl, Martin, & Johansson, 1973; Kniskern, 1979). Each of these studies have used slightly different methodologies and different structured and unstructured situations to accomplish their individual purposes. One of the purposes of these studies of normal families has been to identify specific situations that can be observed in the home and in a clinic setting. By finding a situation that is easy to observe in a clinic setting and is also analogous to what actually occurs in the home, researchers have hoped that such situations would be useful for the family therapist that does not have the resources or time to observe a family at home.

Present research however, indicates that there is little support for the position that clinic observation of the family unit can be used to assess family interaction in the home (Eyberg & Johnson, 1974; Forehand & Kay, 1977; Martin, 1970; Rapaport & Benoit, 1975; Schalock, Note 1). As a result of this apparent trend, therapists who favor a behavioral approach may begin to assess family interaction in the natural setting. One obvious and important question that a therapist must ask is: What situations or tasks that typically occur in the home might provide an important perspective on how family members function

together? Besides the nature of the situations, other critical variables to the therapist might be family size, sex of siblings, and ages of siblings.

When focusing on families with relatively young children, one task or situation that is typical of parent-child and sibling-child interaction is play. Kniskern (1979) used structured play situations to investigate the effects of the absence or presence of a sibling on mother-target child interactions.

The purpose of the present study was to expand upon the methodology of Kniskern (1979) by modifying the Dyadic Parent-Child Interaction Coding System (Eyberg, Robinson, Kniskern, & O'Brien, Note 2) to record the interactions of the target child with mother, father, and older sibling. In addition, the present study explored how behavioral interactions in two-male-sibling families during structured play may be affected by the relative ages of the siblings involved. Of particular interest was the exploration of which behaviors may be able to discriminate one family group from another, or one interaction situation from another.

Method

Participants

Twelve families, in which the children had never been referred for behavioral problems, were recruited from Lodi, Stockton, and Manteca, California. Both the mother and father in each family were the natural parents. Families were recruited through nursery schools, family

recreational agencies, and elementary schools. Once lists of families were obtained from these organizations, letters of recruitment were mailed to potential participants.

School age group. Each family had two male children, and was categorized by age and birth order into three groups of four families each: (a) both children of preschool or nursery school age (2-5 yrs); (b) one child of preschool age (2-5 yrs) and one child of elementary school age (6-9 yrs)(referred to as Pre/Elementary); and (c) both children of elementary school age (6-9 yrs).

Income. The median level of adjusted gross income was $23,000 - 23,999/yr., with a range of $18,000 - 50,000+/yr.

Education. The median number of years of formal education was 14 yrs. for both mothers and fathers. Out of a total of 24 parents, the highest educational degree attained for 12 (50%) parents (mothers = 7, fathers = 5) was the high school diploma. The next largest degree group were those with the B.S./B.A. degree, accounting for 25% (mothers = 3, fathers = 3) of the total sample. The A.A. degree was attained by 16.7% of parents (mothers = 2, fathers = 2), and graduate degrees by 8.3% of parents (mothers = 0, fathers = 2).

Occupation. At the time that the data were collected, none of the mothers reported a full time employment position, and 2 of 12 mothers reported part time employment. Managerial business occupations were reported by 50% (n = 6) of the fathers, followed by 25% (n = 3) in medical/science professional positions and 25% (n = 3) in city/county positions.

Religion. All families indicated a religious preference; 58.3% (n = 7) were Protestant and 41.7% (n = 5) were Catholic.

Incentive for participation. Since families were asked to be observed for several sessions, it was important that all families complete all of the observational sessions. Thus, an incentive was used to motivate the families to complete the study. Upon completion of the study each child received a $25.00 U.S. savings bond. This type of monetary incentive was believed to be more appealing to most families than cash payment because of its focus on the children. Research does indicate that payment for participation is an effective method of motivation (Patterson, McNeal, Hawkins, & Phelps, 1967; Toobert, Note 3).

Procedure

Each family was observed in their home for 30 min, once a week for 5 consecutive weeks. A rational for recording family interactions once a week rather than five consecutive evenings is that the possibility exists that families with small children will often have "runs" of bad days and atypical "bad" interactions. According to Patterson (Note 4) this is a sound argument for using spaced sampling sessions and is relatively consistent with his data. The use of five observation sessions is more than adequate to obtain relatively stable measures of behavior. Other family interaction studies have reported analyses which lead them to conclude that a minimum of three sessions appear to provide stable measures for most behavioral code categories (Harris 1969; Cobb, 1970; Dysart, 1973; Patterson, Cobb, & Ray, 1973).

As much as possible, each weekly session occurred on a different day of the week (Sunday through Friday). Each session began approximately 1/2 hr after dinner. Observation took place in either the family or living room. Each family was asked to have no visitors. Audio or visual entertainment systems, including radio, stereo, and television, were turned off. No outgoing phone calls were made, but incoming phone calls were answered briefly. Each 30 min of interaction was recorded by two observers working independently.

At the conclusion of the study a questionnaire was mailed to each family which asked for information on family income, religion, family activities, and frequency with which parents played with their children. In addition families were sent a preliminary report of results. Included in the results were the procedure for assessing behavior code reliability and one-way analyses of variance that were computed for each behavior across school age groups and interaction situations.

Interaction coding system. The coding system used was a modification of the Dyadic Parent-Child Interaction Coding System (Eyberg, Robinson, Kniskern, & O'Brien, Note 2) and provided a frequency count of 34 discrete positive and negative behaviors which may occur between parent/sibling and child during play. Most of the behavioral categories and their definitions have been described in coding manuals developed by Hanf (Note 5), by Patterson, Ray and Shaw (1969) and in a subsequent revision by Eyberg (1974).

Two standard play situations make up the Dyadic Parent-Child Interaction Coding System procedures: (a) child-directed interaction (CDI), and (b) parent-directed interaction (PDI). In the present study a third play situation was added, in which the older sibling was the agent directing the interaction between himself and the younger target child. This third situation was called sibling-directed interaction (SDI).

The standard procedure for the Dyadic Parent-Child Interaction Coding System requires the child-directed play situation to occur first, followed by the parent-directed play situation. No protocol has been established for the order of presentation of mother-directed, father-directed or sibling-directed play situations for the present coding system. Therefore, the order of presentation of these three play situations, following the child-directed play situation, were determined randomly for each family. In the child-directed play situation there were three dyadic interaction situations. The order of presentation of these three child-directed interactions were also randomly determined for each family.

By involving the younger child with all three family members, six interaction situations were generated: (a) child-directed interaction with mother, (b) child-directed interaction with father, (c) child-directed interaction with sibling, (d) mother-directed interaction, (e) father-directed interaction, and (f) sibling-directed interaction. In the child-directed interaction situations (a, b, and c above) the younger child was told, "In this situation, choose any activity you wish, and

(parent or sibling) is to play along with you as you wish." Instructions to the parent or sibling in the parent or sibling-directed interaction situations (d, e, and f above) were: "In this situation, it is your turn to choose the game. You may choose any activity. Keep (younger child) playing with you according to your rules."

A frequency count of all parent/sibling and child behaviors occurring in the interactions was recorded at 1 min intervals. Each coding sheet represented 1 min of data collection. In order to reduce the obtrusiveness of the coding sheets, each sheet was taped into a page of an oversized magazine (e.g., Life), to give the appearance that the observers were reading a magazine. Each 60 sec the observers received an auditory signal through earphones from a timer attached to the belt of one of the observers. At the sound of the "beep," the observers turned to the next page of their magazines. Each situation involved 5 min of interaction. The total coding procedure required 30 min of observation.

The total number of cases possible in the study were 360 (12 families x 5 sessions x 6 interaction situations). One case of sibling-directed interaction and one case of father-directed interaction in two families were not able to be recorded. In one case the target child decided to sit in an observer's lap (during the first session) and in the second case the father was called away on an emergency. Therefore these data were discarded and a total of 358 cases were reported.

Toys. A standard set of toys that allowed for relatively quiet play activity was used for each family. These toys consisted of (a) natural wood blocks, (b) a Tinkertoy® construction set, (c) a set of Lincoln Logs®, (d) two Tente® multipieced construction toys, (e) coloring books with a set of 48 crayons, (f) a Fisher-Price® ring toss, (g) a Nerf® car, (h) a stuffed toy seal, and (i) a stuffed toy elephant.

Observer training. Four observers participated in the study. The author coded all 60 sessions for all 12 families, while two observers coded 35 and 25 sessions, respectively. These two observers were paid for work in the study. One of the two observers mentioned above and a fourth observer conducted six intermittent reliability checks over the 60 sessions. Observers began their training by studying the Dyadic Parent-Child Interaction Coding System manual with addendum regarding modifications for the present study. Each observer required approximately 22 hrs of training in the use of the coding system. The training involved practice sessions viewing videotapes of family interaction depicting the play situations, and live practice sessions with a volunteer family. Observers continued training until they reached an interobserver reliability level of $r = .80$. Once the observers demonstrated complete knowledge of the code categories and met the reliability criterion, they were allowed to take part in the study.

Observer reliability. Robinson and Eyberg (Note 6) have reported reliability coefficients of $r = .91$ for parent behaviors and $r = .92$ for child behaviors for the Dyadic Parent-Child Interaction Coding System.

Reliability was measured based on interobserver agreement. Interobserver agreement is based on the ability of two or more observers to record the same information while independently watching the same situation at the same time (Patterson, 1977).

The coded behaviors recorded by the two observers in each 60 sec interval were collapsed into 5 min situations or "session" intervals. Reliability of the resulting interval data recorded by the two observers was computed using the Pearson product-moment correlation (r). Acceptable values of session reliability for r should exceed 0.60 (Hartmann, 1977).

Reliability checks were conducted by two observers. One reliability observer was a graduate student who trained for 22 hrs on the coding system and conducted three reliability checks during the first 35 sessions. The other reliability observer had been a full time observer for the first 35 sessions and afterwards conducted three intermittent reliability checks during the remaining 25 sessions. Six reliability checks were conducted on six different families during the 5th, 9th, 33rd, 36th, 56th, and 57th sessions. All six reliability checks were made "unannounced"; that is, neither the author nor the other regular observer were aware of a future reliability check until several hours before the session began.

Results

Behavior Code Reliability

Using the frequency of a behavior recorded during a 5 min interaction situation as the unit of measurement (n = 30 for 10 families; n = 29 for 2 families), Pearson r correlations were computed on 34 discrete behaviors between the first and second observer for each family, and between the first, second, and reliability observers for six families. A total of 816 correlations were computed to assess behavior code reliability,which yielded 12 behavior codes whose median correlation values were mostly in the mid .90's, with a range of .78 to 1.0.

Table 1 shows the median Pearson r values for the first observer with the second observer, and median Pearson r values for the third reliability observer with the first and second observers. Based on third observer median correlations with the first and second observers, the second observer had higher reliability coefficients for seven behavior codes and the first observer had higher coefficients for five behavior codes. Since the second observer had higher reliability coefficients for more behavior codes than did the first observer, all subsequent data analyses were performed on the data recorded by the second observer.

Stepwise Discriminant Analyses

Stepwise discriminant analyses (Klecka, 1975) were performed on the three principal independent variables: school age group, interaction situations, and sessions, and combinations thereof. The basic idea of discriminant analysis is to find the linear combination of behaviors

Table 1

Behavior Code Reliability Coefficients

Behavior code	Observer 1 and 2 Median r	Observer 1 and 3 Median r	Observer 2 and 3 Median r
Acknowledge	.857	.890	.935
Critical Statement	.845	.970	.900
Laugh	.935	.970	.960
Unlabeled Praise	.920	.940	.980
Descriptive/Reflective Question	.945	.975	.980
Descriptive Statement	.830	.810	.930
Direct Command	.905	.925	.905
Respond to Child Laugh	.965	.995	.990
Compliance/Direct Command	.875	.810	.915
Child Change Activity	.780	.800	1.00
Child Laugh	.940	.980	.970
Child Whine	.875	.875	.945

that will maximize the differences between groups relative to the differences within the groups (Lindemann, Merenda, and Gold, 1980). Discriminant analysis is an effective means of determining if there are particular combinations of behaviors which would reliably discriminate one group from another, one interaction situation from another, or one session from another.

Sessions. A stepwise discriminant analysis of discrete behaviors on the sessions variable found that both univariate F-ratios and minimum tolerance levels for all behavior codes were insufficient (minimum F to enter = 1.0) for inclusion in the analysis.

School age groups. Results of a stepwise discriminant analysis of discrete behaviors found that the linear combination of Child Change Activity, Descriptive/Reflective Question, Child Whine, and Unlabeled Praise correctly classified only 57% of cases as members of the groups to which they actually belonged (see Table 2).

In the above analysis an inspection of the group centroids defined by the first discriminant function in Table 3 showed that the preschool age group was distinguishable from the other two groups. As a result of this finding, an additional stepwise discriminant analysis involved grouping families such that one group contained older siblings that were of preschool age (2-5 yrs.), and the second group contained older siblings of elementary school age (6-9 yrs.), combining the former preschool-elementary group and elementary-elementary group.

Table 2

Classification Results on School Age Groups

Actual Group	No. of Cases[1]	Predicted Group Membership		
		1	2	3
Group 1 Preschool	119	91 76.5%	24 20.2%	4 3.4%
Group 2 Pre/Elementary	119	8 6.7%	59 49.6%	52 43.7%
Group 3 Elementary	120	12 10.0%	54 45.0%	54 45.0%

Percent of "grouped" cases correctly classified: 56.98%

1 - Number of cases = 4 families x 5 sessions x 6 situations (minus one situation from Preschool Group and one situation from Pre/Elementary Group).

Table 3

Stepwise Discriminant Analysis on School Age Groups

Step	Action Entered	Wilk's Lambda	Sig.
1	Change Activity	.704484	<.0001
2	Descriptive/Reflective Question	.605263	<.0001
3	Whine	.530582	<.0001
4	Unlabeled Praise	.492620	<.0001

Canonical Discriminant Functions

Function	Eigenvalue	Percent Variance	Cumulative Percent	Canonical Correlation	After Function	Wilk's Lambda	X^2	D.F.	p
					0	.4926196	250.28	8	<.0001
1*	.93675	95.11	95.11	.6954651	1	.9540822	16.676	3	<.0008
2	.04813	4.89	100.00	.2142845					

* Marks the 1 canonical discriminant function to be used in the remaining analysis.

Standardized Canonical Discriminant Function Coefficients

Behavior Code	Function 1
Unlabeled Praise	.35097
Descriptive/Reflective Question	.49842
Whine	.51825
Change Activity	.90902

Canonical Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Preschool	1.36571
Preelementary	-.66186
Elementary	-.69799

Table 4 and 5 show the results of the stepwise discriminant analysis of discrete behaviors. Table 4 shows that a linear combination of Child Change Activity, Child Whine, Descriptive/Reflective Question, Unlabeled Praise, and Child Laugh were able to correctly classify cases 87% of the time. Table 5 shows that before the first function was removed lambda was .5012 which indicated considerable discriminating power in the behaviors included in the analysis.

Evaluation of the canonical discriminant function coefficients of each behavior at group centroids indicated that all behaviors were positively weighted with the preschool sibling group of families and negatively weighted with the families with older siblings of elementary school age.

Table 6 shows that one-way analyses of variance of the five discrete behaviors indicated that families with older siblings of preschool age had significantly higher rates of Child Change Activity (nine times higher), Child Whine (four times higher), Descriptive/Reflective Question (1.6 times higher), Unlabeled Praise (two times higher), and Child Laugh (two times higher) than did families with older siblings of elementary school age.

Interaction situations. Although Table 7 shows that the percentage of cases correctly classified was low (41%), further inspection of Table 8 shows that the first discriminant function evaluated at group centroids indicated a clear separation between parent-child (Groups 1, 2, 4, & 5) and sibling-child (Groups 3 & 6) interaction situations. An

Table 4

Classification Results on Preschool Sibling and Elementary Sibling Groups

Actual Group	No. of Cases[1]	Predicted Group Membership	
		1	2
Group 1 Preschool Sibling	119	92 77.3%	27 22.7%
Group 2 Elem Sibling	239	19 7.9%	220 92.1%

Percent of "grouped" cases correctly classified: 87.15%

1 - Number of Cases for Group 1 = 4 families x 5 sessions x 6 interaction situations (minus one situation). Number of Cases for Group 2 = 8 families x 5 sessions x 6 interaction situations (minus one situation).

Table 5

Stepwise Discriminant Analysis on

Freschool Sibling and Elementary Sibling Groups

Step	Action Entered	Wilk's Lambda	Sig.
1	Change Activity	.704657	<.0001
2	Descriptive/Reflective Question	.623734	<.0001
3	Whine	.546959	<.0001
4	Unlabeled Praise	.516431	<.0001
5	Laugh	.501217	<.0001

Canonical Discriminant Functions

Function	Eigenvalue	Percent Variance	Cumulative Percent	Canonical Correlation	After Function	Wilk's Lamoda	x^2	D.F.	p
1*	.99514	100.00	100.00	.7062455	0	.3012172	244.17	5	<.0001

* Marks the 1 canonical discriminant function to be used in the remaining analysis.

Standardized Canonical Discriminant Function Coefficients

Behavior Code	Function 1
Unlabeled Praise	.36163
Descriptive/Reflective Question	.49767
Child Laugh	.24571
Whine	.53756
Change Activity	.89620

Canonical Discriminant Functions Evaluated at Group Means (Group Centroids)

Group	Function 1
Preschool Sibling	1.40978
Elementary School Sibling	-.70194

Table 6

Comparison of Means, Standard Deviations, and Univariate F-Ratios

Between Preschool Sibling and Elementary Sibling Groups

Group	Behavior Code	Mean	S.D.	df	F	p
Preschool Sib	Change Activity	2.597	2.775	1,356	149.2	<.0001
Elem Sib		.284	.663			
Preschool Sib	Child Whine	1.605	2.505	1,356	31.45	<.0001
Elem Sib		.464	1.343			
Preschool Sib	Desc/Refl Quest	12.118	9.981	1,356	28.38	<.0001
Elem Sib		7.552	6.154			
Preschool Sib	Unlabeled Praise	1.697	2.153	1,356	19.33	<.0001
Elem Sib		.841	1.486			
Preschool Sib	Child Laugh	1.370	2.774	1,356	6.341	<.01
Elem Sib		.699	2.150			

Table 7

Classification Results on Interaction Situations

Actual Group	No. of Cases	Predicted Group Membership 1	2	3	4	5	6
Group 1 CDI/Mother	60	27 45.0%	7 11.7%	13 21.7%	9 15.0%	1 1.7%	3 5.0%
Group 2 CDI/Father	60	20 33.3%	17 28.3%	13 21.7%	3 5.0%	4 6.7%	3 5.0%
Group 3 CDI/Sibling	60	3 5.0%	2 3.3%	14 23.3%	2 3.3%	1 1.7%	38 63.3%
Group 4 MDI	60	21 35.0%	5 8.3%	6 10.0%	17 28.3%	8 13.3%	3 5.0%
Group 5 FDI	59	16 27.1%	8 13.6%	2 3.4%	10 16.9%	20 33.9%	3 5.1%
Group 6 SDI	59	0 0.0%	1 1.7%	3 5.1%	3 5.1%	1 1.7%	51 86.4%

Percent of "grouped" cases correctly classified: 40.78%

1 = Number of Cases = 1 interaction situation x 12 families x 5 sessions (minus one session for FDI and one session for SDI).

Table 8

Stepwise Discriminant Analysis on Interaction Situations

Step	Action Entered	Wilk's Lambda	Sig.
1	Descriptive/Reflective Question	.658540	<.0001
2	Compliance to Direct Command	.503143	<.0001
3	Descriptive Statement	.446472	<.0001
4	Acknowledge	.339522	<.0001

Canonical Discriminant Functions

Function	Eigenvalue	Percent Variance	Cumulative Percent	Canonical Correlation	After Function	Wilk's Lambda	X^2	D.F.	p
					0	.3995221	322.96	20	<.0001
1*	.88342	74.26	74.26	.6848729	1	.7524678	100.11	12	<.0001
2*	.19644	16.51	90.77	.4051983	2	.9002810	36.977	6	<.0001
3*	.09998	8.40	99.18	.3014880	3	.9902937	3.4333	2	<.1797
4	.00980	.82	100.00	.098524					

* Marks the 3 canonical discriminant functions to be used in the remaining analysis.

Standardized Canonical Discriminant Function Coefficients

	Function 1	Function 2	Function 3
Acknowledge	-.41794	.19817	.48260
Desc./Reflect. Question	-.69826	.59196	-.38657
Descriptive Statement	-.13634	-.60954	.74628
Compliance to Direct Command	-.39162	-.58841	-.79971

Canonical Discriminant Functions Evaluated at Group Means (Group CenOtroids)

Interaction Situation	Function 1	Function 2	Function 3
CDI/Mother	-.57560	.54825	.28287
CDI/Father	-.52274	.47593	-.49055
CDI/Sibling	1.17069	.08887	-.05267
MDI	-.70205	-.19575	.44639
FDI	-.81024	-.74378	-.24798
SDI	1.45062	-.18907	.05879

additional discriminant analysis was performed in which interaction situations were combined into parent-child and sibling-child interaction situations.

Table 9 and 10 show the results of the stepwise discriminant analysis performed on discrete behaviors. A linear combination of three parent/sibling behaviors; Acknowledge, Unlabeled Praise, Descriptive/Reflective Question, and three child behaviors; Compliance to Direct Command, Whine, and Change Activity, correctly classified cases 89% of the time. Table 10 shows that Wilk's lambda was .4812 which indicated considerable discriminating power in the behaviors before the function was removed. An evaluation of the canonical discriminant function coefficients of each behavior at group centroids indicated that Descriptive/Reflective Question, Acknowledge, Unlabeled Praise, and Child Compliance to Direct Command were high frequency behaviors associated with the parent-child interaction situations, and Child Change Activity and Child Whine were high frequency behaviors associated with the sibling-child interaction situations.

Table 11 shows that one-way analyses of variance of the six behavior codes indicated that: (a) parents asked questions of the target child at six times the rate of the older siblings, (b) parents acknowledged the target child four times more often than did older siblings, (c) parents gave twice as many unlabeled praises of the target child than did older siblings, (d) the target child complied to direct commands three times more often when interacting with parents than with

Table 9

Classification Results on

Parent-Child and Sibling-Child Interactions

Actual Group	No. of Cases[1]	Predicted Group Membership	
		1	2
Group 1 Parent	239	211 88.3%	28 11.7%
Group 2 Sibling	119	10 8.4%	109 91.6%

Percent of "grouped" cases correctly classified: 89.39%

1 = Number of Cases for Group 1 = 8 families x 6 interaction situations (minus one situation). Number of Cases for Group 2 = 4 families x 5 sessions x 6 interaction situations (minus one situation).

Table 10

Stepwise Discriminant Analysis

on Parent-Child and Sibling-Child Interactions

Step	Action Entered	Wilk's Lambda	Sig.
1	Descriptive/Reflective Question	.680625	<.0001
2	Acknowledge	.579849	<.0001
3	Compliance to Direct Command	.540228	<.0001
4	Change Activity	.515035	<.0001
5	Unlabeled Praise	.493078	<.0001
6	Whine	.481193	<.0001

Canonical Disriminant Functions

Function	Eigenvalue	Percent Variance	Cumulative Percent	Canonical Correlation	After Function	Wilk's Lambda	X^2	D.F.	p
1*	1.07817	100.00	100.00	.7202824	0	.4811932	258.21	6	<.0001

* Marks the 1 canonical discriminant function to be used in the remaining analysis.

Standardized Canonical Discriminant Function Coefficients

Behavior Code	Function 1
Acknowledge	.34321
Unlabeled Praise	.31398
Descriptive/Reflection Question	.70109
Compliance to Direct Command	.30878
Whine	-.21702
Change Activity	-.29753

Canonical Discriminant Functions Evaluated at Group Means (Group Centroids)

Interaction Situation	Function 1
Parent	.73064
Sibling	-1.46741

Table 11

Comparision of Means, Standard Deviations, and Univariate F-Ratios Between Parent-Child and Sibling-Child Interactions

Group	Behavior Code	Mean	S.D.	df	F	p
Parent-Child	Desc/Refl Quest	12.226	7.499	1,356	167.0	<.0001
Sibling-Child		2.731	3.989			
Parent-Child	Acknowledge	3.946	3.240	1,356	108.8	<.0001
Sibling-Child		.739	1.210			
Parent-Child	Unlabeled Praise	1.640	1.976	1,356	71.99	<.0001
Sibling-Child		.092	.319			
Parent-Child	Compliance/Direct Command	2.950	3.775	1,356	48.54	<.0001
Sibling-Child		.496	.999			
Parent-Child	Change Activity	.728	1.321	1,356	19.85	<.0001
Sibling-Child		1.706	2.832			
Parent-Child	Child Whine	.586	1.332	1,356	13.88	<.0002
Sibling-Child		1.361	2.609			

siblings, (e) the target child changed his play activity twice as often when with the older sibling than when with parents, and (f) the target child whined twice as often when interacting with the older sibling than with parents.

Discussion

Session Analysis

None of the statistical analyses performed on the sessions variable were significant. These results would appear to indicate there was no apparent reactivity to being observed, and that families tended to habituate rapidly to observer presence.

Patterson and Cobb (1973) found that in limited samples of families and only 6 to 10 observation sessions, there was no evidence for changes in the mean level of behaviors over sessions. Kniskern (1979) found that behaviors recorded by the Dyadic Parent-Child Interaction Coding System for normal mothers and their children were very consistent across 2 days of observation in a clinic and in their homes. Kniskern states that this consistency in behavior rates may be indicative of little or no reactivity to observer presence. Harris (1970) also suggests that the effects of observer presence are not of such a high magnitude that they can be detected with small samples of subjects.

Presently there are no data in the literature that clearly demonstrate significant observer presence effects for observation studies (Patterson & Cobb, 1973). Patterson, Reid, and Maerov (1979) point out that none of the studies that have tested observer presence effects have

used more than 20 sessions, and this in turn severely limits any statements that can presently be made regarding habituation to observer presence.

School Age Groups

Results of stepwise discriminant analyses on the school age groups variable showed that it was possible to distinguish among two groups of families (those with preschool siblings compared to those with elementary school-age siblings) and correctly classify 87% of cases on the basis of a linear combination of a set of observable, discrete behaviors. The vector of standardized weights corresponding to the canonical discriminant function as shown in Table 7 indicates that the relative contributions of Child Laugh, Unlabeled Praise, Descriptive/Reflective Question, Child Whine, and Child Change Activity were approximately in the proportion 1:1.5:2:2:3.6. One could define the discriminant function, based on the first discriminant criterion, Wilk's lambda, as principally a measure of the target child's rate of activity, negative communication (Child Whine), and parent/sibling questioning (Descriptive/Reflective Question).

It is interesting to note that this function may also correspond to a common sequence of play which is frequently observed of preschool children at play. Vygotsky (1967) made the observation that preschool children at play tend to gratify their desires immediately. When given many things to choose from, as in this study, the child may try out many of them, hence a high frequency of changing play activities. If the

child cannot acquire what is desired, the child may object physically and/or verbally (Child Whine). The final actions of such a sequence may involve questioning of the child (Descriptive/Reflective Question, e.g., "What do you want?"), and either the offering of the object or its removal.

An evaluation of the group centroids (or group means) for the two groups showed that the group consisting of families with preschool siblings had a much higher mean than the group of families with elementary school-age siblings. Thus, the two groups differed significantly on the basis of the canonical discriminant function, which, when evaluated at group centroids showed all behaviors positively weighted with the preschool sibling group of families and negatively weighted with the elementary school-age group of siblings.

It would appear that in families where both children are of preschool age there is a greater frequency of play-related behaviors. These play-related family behaviors decrease significantly when one or both of the children in the family unit is of elementary school age. One possible explanation of this effect is that the nature of play changes for the child entering elementary school (i.e., play becomes more rule-governed), and the subsequent changes in this child's play behaviors may also affect the interaction patterns of all family members when they are involved together in a play situation.

Interaction Situations

On the basis of a linear combination of parent/sibling and child behaviors it was possible to distinguish between two types of interaction situations and correctly classify 89% of cases through the use of stepwise discriminant analyses. The two types of interaction situations, Parent-Child and Sibling-Child, differed significantly on Child Whine, Child Change Activity, Child Compliance to Direct Command, Unlabeled Praise, Acknowledge, and Descriptive/Reflective Question. The standardized canonical discriminant function coefficients of the above behaviors (see Table 10) show their relative contributions to be approximately in the proportion 1:1.4:-1.4:-1.4:-1.6:-3.2. Thus, Descriptive/Reflective Question is about twice as important as Acknowledge and three times more important than Child Whine, Child Change Activity, or Child Compliance to Direct Command in its contribution to the discriminant function. The dominant characteristic of the discriminant function would appear to be questioning of the target child.

When the canonical discriminant functions were evaluated at the group means for Parent-Child and Sibling-Child interaction situations, it was found that high frequency of Child Whine and Child Change Activity is associated with Sibling-Child interaction situations, and high frequency of Descriptive/Reflective Question, Acknowledge, Unlabeled Praise, and Child Compliance to Direct Command is associated with Parent-Child interaction situations. It would appear that for the families in this study the predominant behaviors in parent-child play

that distinguished these situations from sibling-child play were "controlling," positive kinds of behaviors.

Parents tended to take control of the play situation by directing the child's activity, often through the use of commands and questions. Parents also attended to the child's activity by acknowledging and praising his actions. Siblings on the other hand tended to be less controlling of play situations. The target child tended to change his activities more often when interacting with his sibling and was generally more negative and whiny (see Table 11). Siblings asked fewer questions, used less commands, and were less attentive to the target child. A reasonable explanation for these results is that the sibling may have generally been more interested in his own activity, while parents became more involved with and focused on the target child's activities.

This study shows how discriminant analysis can be a powerful tool in statistically distinguishing between two or more groups; groups of families or types of interaction situations were distinguished along dimensions of observable, discrete behaviors. There are, no doubt, a variety of additional measures that exist which may distinguish one type of family from another. For example, in terms of child or family development there may exist a variety of measures that distinguish "preschool familes" from "elementary school-age familes" from "high school-age families." There may also exist linear combinations of measures that distinguish groups of families on the basis of the number and sex of

children, or along several parental characteristics. Discriminant analysis at present has been seldom used in behavioral research. This study indicates some of the potential it may have as a method of classification and diagnosis of types of families and stages of family development.

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